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ABSTRACT

This training outline for grader operators, one in a series of eight outlines, is designed primarily for company training foremen or supervisors and for trainers to use as an industry-wide guideline for heavy equipment operator training in open pit mining in British Columbia. Intended as a guide for preparation of lesson plans both for classroom and on-the-job training activities, this outline is divided into eight modules. Each module is based on 2 to 24 objectives. For each objective, key points and procedures are outlined. Module topics are basic safety and operating rules, communications, indicators and controls, pre-start and operational checks, basic operation, grader production, service and refuel, and special assignments. A skill profile chart is attached. (YLB)

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OPEN PIT MINING JOB TRAINING SERIES

GRADER OPERATOR

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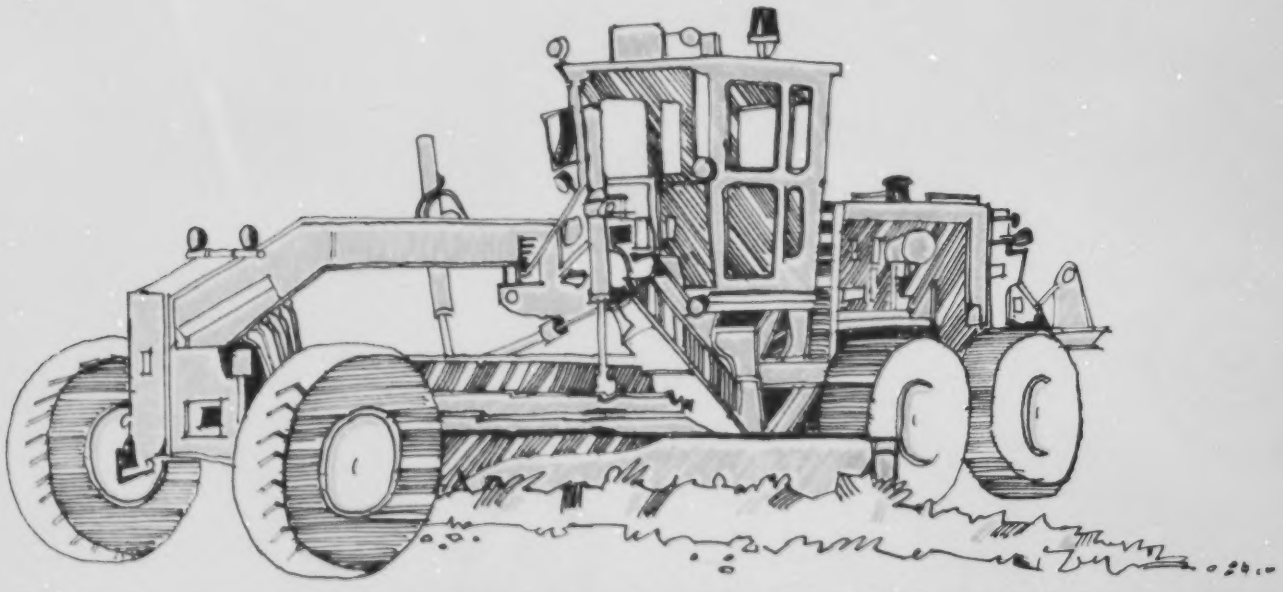

Titles in the Open Pit Mining Job Training Series

- Haulage Truck Operator
- Rubber Tire Dozer Operator
- Track Dozer Operator
- Front End Loader Operator
- Grader Operator
- Rotary Drill Operator
- Shovel Operator
- Heavy Duty Tireman

OPEN PIT MINING
JOB TRAINING SERIES
GRADER OPERATOR

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and
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Mining Association of British Columbia

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INTRODUCTION

The *Open Pit Mining Job Training Series* was developed through the co-operation of member companies of the Mining Association of British Columbia and the Post-Secondary Department of the Ministry of Education. The series was initiated by the education and training committee of the Mining Association. The committee chairman, Les Redford, has given invaluable support throughout the project.

The training outlines in the series are primarily written for company training foremen or supervisors and for trainers to serve as an industry-wide guideline for heavy equipment operator training in open pit mining in British Columbia.

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THE DEVELOPMENT PROCESS

DACUM

Each of the training outlines in the series was developed using the DACUM process, a systematic model for developing modular training programs. A series of four booklets describing the DACUM process is available from:

Publication Services Branch,
Ministry of Education,
878 Viewfield Road,
Esquimalt, B.C.
V9A 4V1
Telephone: (604) 387-5331

Project Initiation

The Mining Association's education and training committee gave early direction to the project. Committee members actively working with chairman Les Redford were:

Bill Scribner, Brenda Mines Limited

Bill Dement, Craigmont Mines Limited

Tom Nicholson, Mining Association of British Columbia

Glen Martin, Similkameen Division, Newmont Mines Limited

Vic Dawson of the Ministry of Energy, Mines and Petroleum Resources also participated with the committee in setting directions.

The first workshop with representatives from the mining industry, the Mining Association, and the Ministry of Education was held in April, 1979. Project goals and priorities were set and an activity plan was established.

DACUM Workshop and Skill Profile Charts

A three day DACUM workshop was held in June 1979. This workshop was conducted by Diane Morrison, a program developer from the Ministry of Education. The following representatives participated in the workshop:

Fred Mason, Afton Mines Limited

Ivan Moser, Afton Mines Limited

Bill Savilow, B.C. Coal Ltd.

Vern Bouck, Bethlehem Copper Corporation

Ray Chenier, Bethlehem Copper Corporation

Bill Scribner, Brenda Mines Limited

Ron Owens, Cyprus Anvil Mining Corporation

Dennis LeDuc, Endako Mines Division, Placer Development Limited

Terry Perrier, Fording Coal Limited

Barry Tripp, Granisle Mine, Noranda Mines Limited

Tom Nicholson, Mining Association of British Columbia

Fred Savage, Ministry of Education

Jack Murray, Noranda Mines Limited

Ed Rudolph, Noranda Mines Limited

Don Rankin, Similkameen Division, Newmont Mines Limited

Don Barker, Zapata Granby Limited

The DACUM workshop produced heavy equipment operator skill profile charts. Each chart listed the essential skills needed by the operator on the job. During the following months, the skill profile charts were circulated to representatives throughout the mining industry for validation.

Training Outlines

Once the skill profile charts were approved, the next step was to write training outlines. For each skill on the charts, one or more objectives were written that state what the trainee must be able to perform at the end of the training program to demonstrate mastering the skill. A trainee who can do all the objectives in the outlines is considered to have the skills required to perform on the job. A training outline developed using this approach is often referred to as a performance or competency-based outline.

Bill Savilow from B.C. Coal Ltd. (formerly Kaiser Resources) was selected to write six training outlines from the skill profile charts. He worked part-time on the outlines while continuing his responsibilites in the training department at B.C. Coal. Bill wrote the *Haulage Truck Operator, Rubber Tire Dozer Operator, Track Dozer Operator, Front End Loader Operator, Grader Operator* and *Rotary Drill Operator* outlines during 1980 and 1981.

Don McColman of Newmont Mines wrote *Heavy Duty Tireman,* and Larry Hartley of Utah Mines wrote *Shovel Operator.*

Bruce Kurschenska of B.C. Coal Ltd. supplied the photographs upon which the cover illustrations are based.

Reviewing the Training Outlines

Throughout 1980 and 1981 a series of workshops were held to review the outlines. The workshops were conducted by Diane Morrison and attended by participants from various mining companies. The participants who played an extremely important role in examining and revising the training outlines to reflect training standards required across the industry were:

Hans Geertsema, Afton Mines Limited

Fred Mason, Afton Mines Limited

Bill Savilow, B.C. Coal Ltd.

Vern Bouck, Bethlehem Copper Corporation

Jerry LeBlanc, Bethlehem Copper Corporation

Don Miller, Brenda Mines Limited

Gerry Cooper, Brinco Mining Limited

Richard Schwengler, Equity Silver Mines Limited

Don Fraser, Cyprus Anvil Mining Corporation

Terry Wozniak, Fording Coal Limited

Norm Myhre, Gibraltar Mines Limited

George Sutherland, Highmont Operating Corporation

Fred Savage, Ministry of Education
Don McColman, Newmont Mines Limited
John Graham, Noranda Mines Limited
Charles Heikkila, Noranda Mines Limited
Les Redord, Noranda Mines Limited
Dennis LeDuc, Placer Development Limited
Larry Hartley, Utah Mines Limited

Field-testing the Haulage Truck Operator Outline

In June 1980 three companies (B.C. Coal Ltd; Noranda Mines Limited, Granisle Mine; Brinco Mining Limited) offered to field-test the new *Haulage Truck Operator* outline for a six month period and report back to the group. During the fall, it was further agreed that the other participating mines in the project would also field-test the outline and would complete a questionnaire. In the winter of 1981 all mines reported that the outline had been used successfully to improve the truck operator training at their mine and some reported making major revisions of their training programs as a result of the outline.

USE OF TRAINING OUTLINES

Additions and Modifications

References are made in the outlines to areas where policies will vary from company to company and it is up to trainers to insert their company policies in these places.

Each training outlines is based on a specific manufacturer and model of equipment, for example the grader is a Caterpillar 16-G. In order to use the material for a different manufacturer or model, a trainer must review the outline and made necessary modifications. It is anticipated that only the section on gauges and controls will need major changes.

For Lesson Plans

The outlines do not contain lesson plans. Rather the trainer should use the outlines as a guide when preparing lesson plans both for classroom and on-the-job training activities. Trainers are encouraged to expand upon the outlines to suit their own situation.

For Testing

The outline should also be used as a guideline for written, oral, and practical testing. Trainers should ensure that upon completion of training, each trainee can perform every objective listed in the outline. It will take time and experience on-the-job before a trainee becomes a proficient operator. Regular on-the-job monitoring by supervisors and trainers can greatly assist the trainee in developing and maintaining the skills needed to be a heavy equipment operator.

Sample tests for the outlines have been written and are available to trainers from:

Research & Curriculum Development Branch,
Ministry of Education,
7451 Elmbridge Way,
Richmond, B.C.
V6X 1B8
Telephone: (604) 278-3433

For Trainees

The outlines provide valuable information on operating heavy equipment and give clear statements on what trainees must be able to do by the end of their training. Therefore, it is recommended that trainees be given a copy of both the skill profile chart and the outline.

BASIC SAFETY AND OPERATING RULES

module 1

OBJECTIVE 1-1

The grader operator will explain how safety and operating rules set by the company and the *Mines Regulation Act* protect the operator and fellow workers on the mine site.

KEYPOINTS/PROCEDURES

1. The following are basic safety and equipment operating rules. Individual companies should incorporate their own safety rules into this material.

2. **Personal wear**

   The safety rules concerning personal wear are set for the protection of the grader operator and include proper:

   - Hard hats
   - Footwear
   - Eye protection
   - Hearing protection
   - Gloves

3. **Personal conduct**

   Rules concerning personal conduct are enforced for the safety of all personnel on the mine site and cover:

   - Horseplay
   - Reading on the job
   - Alcohol and drugs

4. **Pre-start check**

   Safety rules ensure personal protection while conducting pre-start checks and also ensure that the grader is in a safe operating condition before it is put into production. Special caution is required when:

   - Working around moving components on the grader such as fans and belts.
   - Removing radiator caps.
   - Climbing on or off the grader.

   It is essential to report immediately any operational problems with brakes or steering. Graders must always be equipped with a fire extinguisher.

   Rules 263 (d) and 263 (e) the *Mines Regulation Act* and rules 195 (d) and 195 (e) of the *Coal Mines Regulation Act* state:

   > (d) The driver or operator of any vehicle or mobile equipment shall examine and test his equipment at the beginning of each shift before putting it into use; and if any unsafe condition is noted, such equipment shall not be used and the immediate supervisor shall be notified.
   >
   > (e) For each vehicle or piece of mobile equipment, a logbook or other suitable record shall be maintained, in which shall be entered a record of all unsafe conditions and the repairs made, and all notations shall be signed by the person making the entry, and the logbook or records shall be available for inspection at all times.

   It is the grader operator's responsibility to comply with these rules.

5. Operating

Operating rules ensure the safety of the grader operator and of all other persons on the mine site.

Only persons authorized by the company are allowed to operate graders.

There are blind areas immediately surrounding the grader. Before the grader is moved inspect the area on foot in the yard or visually in the pit. Rule 264 (a) (iii) of the *Mines Regulation Act* and rule 196 (a) (iii) of the *Coal Mines Regulation Act* state:

> No person shall operate or put in motion any vehicle or mobile equipment unless he has just previously inspected on foot the area over which the equipment is to be moved.

The grader operator must immediately follow all warning signals given by others on the mine site including horns, lights and hand signals. These signals are covered in OBJECTIVE 2-1.

6. Traffic control scheme

It is the grader operator's responsibility to obey the traffic control scheme as set out by the company. Rule 264 (b) of the *Mines Regulation Act* and 196 (b) of the *Coal Mines Regulation Act* state:

> The owner, agent, or manager of every mine shall prepare a traffic control scheme for his operation and shall have it accepted by the Inspector, and the scheme shall show the maximum allowable speeds for the vehicles in use, rules for passing, "stop" and "yield" locations, priority rules for various vehicles, rules for night operation, maximum operating grades, emergency run-off protection, and such other information as may be required by the Inspector.

7. Dumping

Dumping rules ensure a safe and efficient operation at the dumping area. The dump supervisor is the key person and has direct control of activities in the dump area. The grader operator should be alert for the following conditions:

- Settling dumps with either cracks or slippage.
- Improper incline at the edge of the dump.
- Improper consistency of the berm (snow and ice; sand or fine grade materials).
- Additional equipment around the dump.
- Excessive traffic in the area.

Rule 272 of the *Mines Regulation Act* and rule 203 of the *Coal Mines Regulation Act* state:

> (a) No material shall be dumped from any vehicle over a bank more than ten feet high unless
>
> (i) there is available an effective ridge of material, or an anchored dump block, to act as a backstop; and
>
> (ii) there is a dump supervisor who shall be responsible for signalling and truck-dumping procedures and for checking and reporting the stability of the dump; but the Inspector may exempt an operation from the requirement of this paragraph where:

(A) the haulage truck capacity is less than forty tons; or

(B) the tonnage being dumped is less than five hundred tons in an eight-hour shift; or

(C) the nature of the material being dumped does not require a dump supervisor; but in no case shall dumping be done from an unsafe bank.

(b) Where a dump supervisor is employed at a dump, no person shall move or dump a truck at the dumpsite unless and until he receives a directional order from the dump supervisor.

8. Servicing

Servicing rules ensure the safety of all persons in the service area. The grader operator must take the following precautions:

- Never smoke or strike an open light while fuelling.
- Always clear the area of people before moving the grader in or out of the service area.
- Add oil or grease only when the grader engine is shut off.
- Remove the radiator cap only when the engine is cold.
- Lower the blade to the ground slowly.

Servicing procedures are covered in Module 7.

9. Parking

Safe parking procedures are established to provide safety for the people working around the grader. The operator must obey the following procedures for leaving the grader:

a. Park in a safe and convenient area.

b. Reduce the engine speed.

c. Press down on the service brake pedal to bring the grader to a complete stop.

d. Place the transmission control lever into neutral.

e. Set the park brake and the transmission control lever lock.

f. Lower the blade and the ripper assembly to the ground and apply slight down pressure.

g. Position the governor control lever at low idle and let the engine cool down for five minutes.

h. Push the governor control lever to off.

i. Pull the accelerator up past detent to stop the engine.

j. Turn off the disconnect switch.

OBJECTIVE 1-2

The grader operator will explain the importance of reporting accidents and injuries.

KEYPOINTS/PROCEDURES

1. **Accidents**

   All accidents must be reported to the supervisor as soon as possible. In the event of a serious accident, do not disturb the accident scene unless there is a risk of further damage or a danger to personnel.

2. **Injuries**

   All injuries, no matter how slight, must be reported to the supervisor and to the first aid station. Any injury where the skin is broken must be treated to avoid infection. In cases of serious injury, do not move the victim — send for the first aid attendant.

3. **Investigations**

   Reporting accidents and injuries makes way for an investigation to be carried out to determine the cause. These investigations often lead to new rules or procedures that create a safer working environment for all employees.

   Note:

   It is the responsibility of all employees to report any hazardous act or condition to their supervisors immediately.

OBJECTIVE 1-3

The grader operator will describe the changing conditions that can occur at the mine site and explain the importance of staying alert to these changes.

KEYPOINTS/PROCEDURES

1. **Weather**

   Rain, snow and fog each have an effect on the operator's visibility. Additional caution is required while operating under poor weather conditions.

2. **Road conditions**

   Road conditions change with the changing weather, e.g., slippery conditions in cold weather and dusty conditions when it's hot. The grader operator must stay alert to these conditions.

3. **Other equipment**

   The grader operator must be alert at all times to other equipment working or travelling in the area. The grader's prime function is road maintenance, and often the work is performed in the middle of haul roads.

4. **Traffice control scheme**

   While trucks are being loaded at the working face, the traffic control scheme is constantly changing and the grader operator must be aware of the changes.

   Usually, the traffic control scheme at the dump area and on the haul roads changes very little, but the grader operator should be aware that a change could possibly occur. If there is increased activity on the haul roads, special precautions must be taken.

5. **Working conditions**

   As working conditions are constantly changing at the work face and on the haul roads, operators must watch for the movement of equipment and the sluffing or rolling down of material from the face. At the dump the grader operator must be alert to the movement of equipment and to the possibility of the dump moving or cracking.

6. **Grader performance**

   An alert operator can determine a change in the grader's performance by sound and by comparing how the grader reacts under normal working conditions. For example, the grader operator can tell if the equipment is losing power.

7. **Light**

   The change from daylight to darkness and vice-versa creates operating conditions that demand added attention and alertness.

OBJECTIVE 1-4

The grader operator will describe the traffic control scheme at the mine site for the haulage roads, the loading area, and the dump area.

KEYPOINTS/PROCEDURES

1. **Right of way**

   The right of way priority system can change from property to property. An example of a right of way priority system is:

   a. Ambulance, rescue or fire trucks.

   b. Buses.

   c. Road maintenance equipment (graders, dozers).

   d. Loaded production trucks.

   e. Empty production trucks.

   f. Explosive trucks and fuel trucks.

   g. All other trucks or equipment (including graders doing work other than road maintenance).

   Caution:

   A set of right of ways provides guidelines, but all operators must use judgement in all circumstances. Remember, a right of way can only be given, it cannot be taken.

2. **Traffic scheme**

   At all times, the grader operator must follow the company's established traffic control scheme unless directed to do otherwise by the supervisor. The grader should give right of way to faster moving equipment during a travelling procedure. These rules may not apply while the grader is doing road maintenance.

3. **Traffic signs**

   Obey all traffic signals and signs including stop signs and yield signs.

4. **Merging traffic**

   Merging traffic must yield to through traffic unless otherwise informed by the supervisor.

5. **Changing road systems**

   When road systems change, operators must be forewarned and also advised as to which traffic has the right of way.

6. **Parking**

   Graders should be parked in a safe, level area. Never park within 50 feet of the work face or within the company's established distance for other equipment. Follow these procedures for parking:

   a. Lower the blade to the ground and apply slight pressure.

   b. Set the park brake.

   c. Put the transmission into neutral and lock.

   d. After a proper cooling down period of at least 5 minutes, shut the engine off.

OBJECTIVE 1-5

The grader operator will explain the importance of avoiding tire damage and the procedures to prevent the damage.

KEYPOINTS/PROCEDURES

1. The grader operator is critical in keeping the road in good repair and helps to eliminate downtime on trucks due to tire damage.

2. **Road hazards**

   The grader operator must constantly be alert to spill rock from trucks, metal objects on the road and pot holes. The operator should push any foreign material off the road while travelling and repair the pot holes.

3. **Work face area**

   In the work face area, the grader operator should be alert to spill rock from haulage trucks and shovel buckets. The loose material must be pushed back into the face for the shovel to load out.

4. **Dumps**

   Loose material left on dumps can be graded to the side so that haulage trucks do not travel over the material.

5. **Windrows**

   The grader operator should keep all windrows short and eliminate any large material as soon as possible.

OBJECTIVE 1-6

The grader operator will explain both normal and emergency braking techniques for stopping the grader.

KEYPOINTS/PROCEDURES

1. **Normal braking**

   For normal braking the grader should:

   a. Reduce the engine speed by letting off the pressure on the accelerator pedal.

   b. Gradually depress the service brake pedal to stop the grader evenly.

   c. Hold the grader at a stop with the service brake pedal.

   d. Place the transmission control lever into neutral.

   e. Apply the park brake by pulling up the park brake knob.

   f. Lower the blade to the ground and apply slight pressure.

   g. Engage the transmission lock.

   h. After a cooling down period of 5 minutes, shut off the engine.

2. **Emergency braking**

   Emergency braking means bringing the grader to a complete stop as quickly as possible. The operator should simultaneously:

   a. Apply the service brakes.

   b. Reduce the engine speed.

   c. Lower the blade and ripper assemblies and apply great pressure so that the blade and ripper cut in.

   These three steps are usually done in one motion.

   Caution:

   Never operate a grader that has a brake problem.

OBJECTIVE 1-7

The grader operator will describe the procedures for emergency steering on the grader.

KEYPOINTS/PROCEDURES

1. **Emergency steering procedures**

   In an emergency such as engine failure or loss of steering, follow these procedures:

   a. Turn on the auxiliary steering switch to activate the auxiliary steering pump.

   b. While steering to the closest safe and convenient area, bring the grader to a complete stop using the emergency braking procedure.

   c. Lower the blade and ripper to the ground.

   d. Put the transmission into neutral and lock.

   e. Apply the park brakes.

   f. Try and locate the problem.

   g. Report the problem to the supervisor.

   Caution:

   Do not operate a grader with a steering problem.

OBJECTIVE 1-8

The grader operator will explain why it is important to maintain good housekeeping practices.

KEYPOINTS/PROCEDURES

1. The importance of good housekeeping is to maintain a safe and pleasant environment to work in. Employees have the responsibility to keep their work area in good condition. Good housekeeping is an essential part of each employee's job. A disorderly and dirty work area can cause accidents, personal injuries and low morale. Good housekeeping on the grader is essential for safety and includes the following:

   - Keep all windows and mirrors clean for good visibility.
   - Keep the dash clean, primarily the indicators, so that they can be accurately read.
   - Keep the cab clean of all paper, rags, dirt, mud and aerosol cans.

   Caution:

   Aerosol cans can cause serious injuries by exploding.

OBJECTIVE 1-9

The grader operator will explain the mine site blasting and guarding procedures.

KEYPOINTS/PROCEDURES

1. The blasting procedure is enacted on the day of the blast. Employees should be notified of the blast, although this notification is not the final precaution. Before blasting, the supervisor makes a careful physical check of the area to ensure that no one is there. All employees are evacuated to a safe distance. All access roads are closely guarded to prevent access into the blast area.
2. The guards have the authority to stop anyone from entering the blast area. Guards are visibly identifiable by a colored vest. They will remain at the location designated by supervision, until relieved by the general foreman or by the person who designated them as guards.
3. Should any irregularities occur, it is the guard's responsibility to immediately notify the supervisor of the problem.
4. Frequently, the grader operator is used as a guard. Operators acting as guards should be on the ground not sitting in the cab, in order to stop all traffic from entering the blast area.

OBJECTIVE 1-10

Given a map of the pit area layout, the grader operator will give the proper names of pits and haul roads and will locate the dump areas by name or number. The dump areas will include waste dumps, stockpiles and breaker station or crusher station locations.

KEYPOINTS/PROCEDURES

1. Each property is different in layout, and in the names and numbers of the dumps, pits, etc.
2. Besides knowing the basic layout of the pit area, some properties may also want employees to know the shovel locations.

OBJECTIVE 1-11

The grader operator will explain and demonstrate the proper use of fire extinguishers and fire suppression systems.

KEYPOINTS/PROCEDURES

1. **Fire extinguishers**

   All graders are equipped with a hand fire extinguisher. Shut down the engine before using the fire extinguisher. Aim the dry chemical flow at the base of the fire and move the flow from side to side. This side to side action forces the flames away from the source and has a cooling effect. The chemical cuts off the oxygen at the source of the flame and puts out the fire.

2. **Fire suppression systems**

   Some graders also have a fire suppression system. The fire suppression system consists of dry chemical tanks mounted on the grader, with pressure source to distribute the chemical powder. Hoses run from the tanks to nozzles at all critical areas of the grader. The operator manually pulls a button that releases the pressure sources and the chemical is released. This can be performed either from the cab or from the ground.

3. Speed is the important factor in combating a grader fire. First shut down the grader's engine. Suppress the fire quickly and avoid being faced with a more widely spread fire that is difficult to contain.

OBJECTIVE 1-12

The grader operator will describe a miss-hole and state the procedure for reporting the location of a miss-hole.

KEYPOINTS/PROCEDURES

1. A miss-hole is a drill hole that was loaded with explosives which did not explode during the blast, leaving the hole still full of powder.
2. A grader operator noticing a miss-hole, while pushing material, should notify the supervisor immediately. Properly mark the miss-hole and do not operate within 25 feet.

OBJECTIVE 1-13

The grader operator will explain the company's power cable handling policy.

KEYPOINTS/PROCEDURES

1. Each company should establish a power cable handling policy to be followed by all personnel handling power cable. The policy should include the following precautions:
   - 10,000 volt hot gloves and other approved protective devices must be used at all times when handling power cable. Do not step on power cable or allow power cable to come in contact with any other part of the body. Inspect the hot gloves before use and discard them if they are defective. Do not use hot gloves if they are wet inside. Hot gloves must be covered with leathers and should not be used for any purpose other than handling power cable.
   - All power cable attached to sub-stations or switch houses must be treated as energized.
   - Never place any part of the body, even if protected by hot gloves, on or near cable terminals located inside potheads and junction boxes.
   - No one, other than an authorized person, is to energize, de-energize, connect or disconnect power cables.
   - Cable arches must be treated the same as power cable when the cable over the arch is connected to a sub-station or switch house. Report any cuts or bruises in the cable. Do not handle damaged power cable unless it has been checked by an authorized person. Only qulified electricians are authorized to make repairs to power cables.
   - Never run over unprotected power cable with any vehicle or piece of equipment.
   - Never pull more than 75 feet of power cable in a single pull. Power cables can be damaged by stretching.
   - When junction boxes and potheads are being moved, they must be adequately supported and kept clear of the pit floor. Rough handling of junction boxes can cause damage to the boxes and to the power cable by the flexing of the cables at the boxes.
   - Disconnected power cable retains a residual charge of about 110 volts. Caution must be used when handling disconnected cable.
   - The input side (hotside) of the switch house must be padlocked, if it is a pothead so that it cannot be removed.

OBJECTIVE 1-14

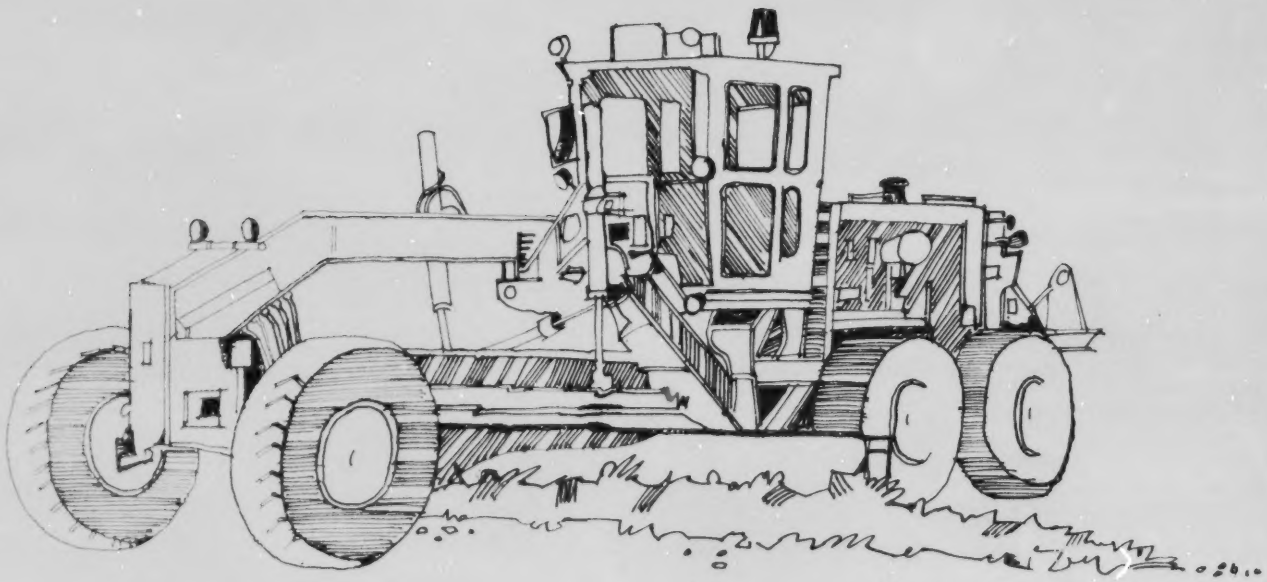
The grader operator will explain the company's lock-out procedures.

KEYPOINTS/PROCEDURES

1. To ensure the safety of maintenance and operating personnel, the company should establish a procedure for locking-out equipment, to be followed by all personnel.
2. Locking-out equipment means that wherever the possibility of equipment starting, energizing, or moving exists, which can create a hazardous situation, that piece of equipment should be locked-out and tagged by the operator. A lock-out procedure is designed to prevent accidents and personal injury. Never remove another worker's padlock or tag without authorization. Check with the supervisor for instructions.
3. The grader operator is required to know the location of the lock-out station for the grader, and must always check the station for padlocks or "do not operate" tags before stating the grader.

COMMUNICATIONS

module 2



OBJECTIVE 2-1

The grader operator will:

a. Describe the horn signals used by the truck, shovel and loader operators.

b. Demonstrate the hand signals that a dump supervisor gives.

KEYPOINTS/PROCEDURES

1. A signal for HELP WANTED should be established at the property and all the employees informed of it.

2. **Truck operator's signals**

   The grader operator is required to know these horn signals:

   - Start engine — one blast.
   - Stop — one blast.
   - Go ahead — two blasts.
   - Back up — three blasts.

   All trucks should be equipped with automatic back up horns. The grader operator should be alert to a haulage truck backing up.

3. **Shovel operator's or loader operator's signals**

   The grader operator is required to know the following signals given by the shovel and loader operators:

   - Stop — one blast.
   - Go ahead — two blasts.
   - Back up — three blasts.
   - Reposition or tail load — four blasts.

4. **Grader operator's signals**

   The grader operator is required to give the following signals to the operators of the other pieces of equipment:

   - Stop — one blast.
   - Go ahead — two blasts.
   - Back up — three blasts.

5. **Grader operator's hand signals**

   - Back up — The grader operator rotates the right arm in a circular clockwise motion to signal the truck back towards the safety berm.
   - Stop — Once the truck reaches the desired place at the berm, or where the load is to be dumped, the grader operator signals a stop by moving the right arm up and down.
   - Dump — When the truck is stopped in the position designated by the grader operator, the signal to dump is given by holding the right arm straight up in the air.
   - Move out — Once the truck has dumped its load over the berm, the grader operator points to the truck that is to move out.

   Caution:

   The truck must never move until the dump body is completely down and the grader operator has signalled the truck to move out.

OBJECTIVE 2-2

Given a sample of the reporting forms used by the company, the grader operator will complete production reports, timecards, and the daily logbook.

KEYPOINTS/PROCEDURES

1. **Production reports**

   The production reports are to be filled out to include the:

   - Area code number of the pit in which the operator is working.
   - Code number of the type of work being done by the grader.
   - Equipment number of the grader that the operator is using. Production reports are used for costing and planning purposes. Therefore it is imperative that they be accurate.

2. **Timecards**

   Timecards should include the:

   - Area code number in which the grader operator is working.
   - Code number of the type of work being performed.
   - Equipment number of the grader that the operator is using.

3. **Daily logbooks**

   The daily logbooks are filled out regularly and cover the following information:

   - General repairs to the grader.
   - Fuel up times so that the oncoming grader operator knows approximately how much fuel is left.
   - Any general information, for example on steering and brakes, can help the oncoming operator.

   Rule 263 (e) of the *Mines Regulation Act* and rule 195 (e) of the *Coal Mines Regulation Act* state:

   > (e) For each vehicle or piece of mobile equipment, a logbook or other suitable record shall be maintained, in which shall be entered a record of all unsafe conditions and the repairs made, and all notations shall be signed by the person making the entry, and the logbook or records shall be available for inspection at all times.

4. It is important that the oncoming operator knows the prior shift's history of the grader. Operators should report unsafe equipment conditions first of all to the supervisor and then to the oncoming grader operator.

OBJECTIVE 2-3

The grader operator will operate the mobile radio on the mine site and explain the proper procedures for its use.

KEYPOINTS/PROCEDURES

1. Proper and effective use of the radio is important. Take the following steps:
   a. Identify the sender by unit or vehicle number.
   b. Identify the receiver by unit or vehicle number.
   c. Wait until the receiver acknowledges.
   d. Relay the message in a clear and precise manner.
   e. State whether the call is an emergency or not.
2. Radio use is restricted to necessary operational transmissions. Use no profane language over the radio at any time.
3. In the event of an unsafe situation or an emergency, contact the dispatcher or supervisor immediately. If radio silence is necessary, either the dispatcher or the immediate supervisor can call for it. This will depend on procedures established at the mine.

OBJECTIVE 2-4

The grader operator will explain the different survey stakes used at the mine site.

KEYPOINTS/PROCEDURES

1. Companies have their own color and flagging codes and should include this information.

2. **Primary control points**

   The primary control point is the basis for all survey work in the area and has been set with the utmost accuracy.

3. **Secondary control hubs**

   Secondary control hubs are set from the primary control point and are the basis of all the actual field work.

4. **Batterboards**

   Batterboards are used for sighting bench grades.

5. **Drill hole stakes**

   Drill hole stakes locate the position of a drill hole for blasting. On the stake is the number of the blast hole and the depth it is to be drilled. These stakes are retained after drilling, for loading information.

6. **Drill limit stakes**

   Drill limit stakes mark the drilling boundary in order to avoid unnecessary drilling.

7. **Digging limit stakes**

   Digging limit stakes indicate the limit the digging is to go. Digging beyond this stake can be a wasted effort.

8. **Blast boundaries**

   Blast boundary stakes indicate the limit of cleanup required to start drilling a new blast area, and possibly the limit of digging of a previous blast.

9. **Dump monitors**

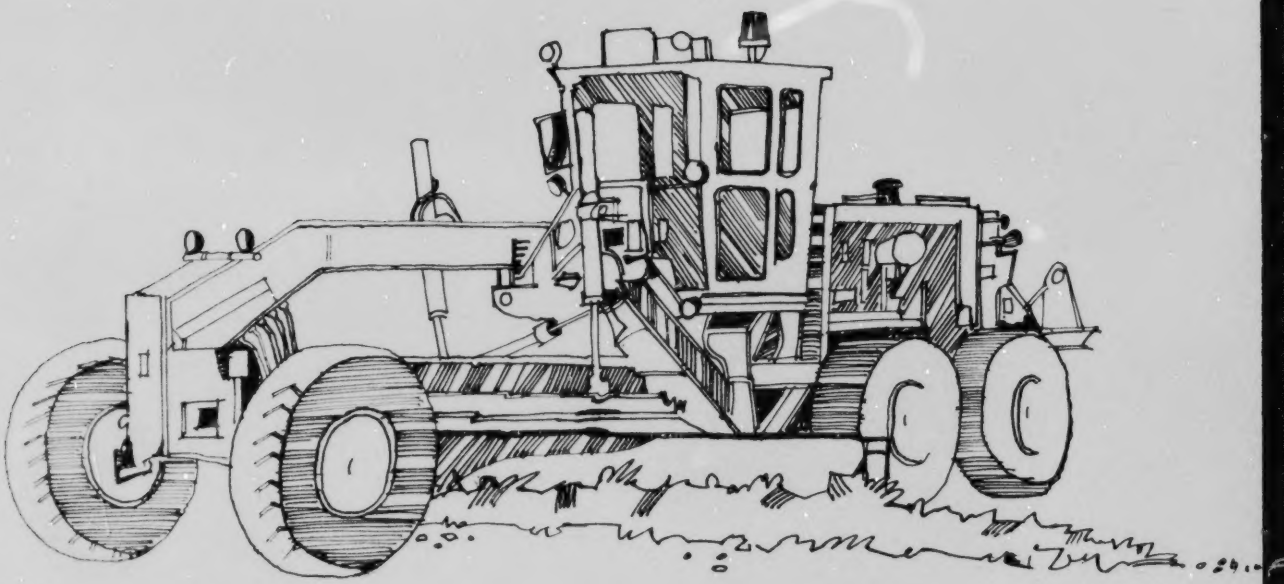
   Dump monitor stakes indicate the amount of settling or movement of a dump. These monitors are extremely important for safety and should be checked regularly.

10. **Road stakes**

    Road stakes mark the center and shoulders of the road surface.

INDICATORS AND CONTROLS

module 3



OBJECTIVE 3-1

The grader operator will locate and identify the indicators, controls and switches in the cab area.

KEYPOINTS/PROCEDURES

1. These grader indicators include:
   - Hour meter.
   - Engine oil pressure gauge.
   - Ammeter gauge.
   - Fuel pressure gauge.
   - Engine coolant temperature gauge.
   - Air pressure gauge.
   - Differential unlock indicator.
   - Alternator discharge indicator.
   - Low air pressure indicator.
   - Engine coolant high temperature indicator.
   - Engine low oil pressure indicator.
   - Articulation indicator.
   - Blade lift accumulator indicator.
   - Center shift (left or right) indicator.
2. Grader controls and switches include:
   - Blade lift accumulator switch.
   - Dome light switch.
   - Disconnect switch.
   - Defroster fan switches.
   - Rotating beacon switch.
   - Windshield wiper switches.
   - Head and tail light switch.
   - Flood light switches.
   - Start switch.
   - Dimmer switch.
   - Circuit breaker reset button.
   - Air conditioning control (if applicable).
   - Heater control.
   - Fan speed control.
   - Transmission control lever.
   - Transmission control lever lock.
   - Parking/emergency brake control.
   - Governor control lever.

- Transmission modulator pedal.
- Brake pedal.
- Accelerator pedal.
- Differential lock.
- Directional lights.
- Decelerator pedal.
- Hydraulic unloading valve lever.
- Blade lift lever (left side).
- Ripper/scarifier lever.
- Blade tip lever.
- Blade circle drive lever.
- Blade side shift lever.
- Articulation lever.
- Front mounted scarifier lever.
- Center shift lever.
- Wheel lean lever.
- Blade lift lever (right side).
- Console lock lever.
- Steering wheel tilt lock lever.
- Center shift lock pin control.
- Horn switch.

OBJECTIVE 3-2

Given a diagram of the control panel, the grader operator will locate the different controls and switches and describe how each is used.

KEYPOINTS/PROCEDURES

1. **Blade lift accumulator switch**

   The blade lift accumulator switch activates or deactivates the accumulator.

2. **Dome light switch**

   The dome light switch activates the dome light within the cab.

3. **Disconnect switch**

   The disconnect switch activates the electrical systems.

4. **Defroster fan switches**

   The front and rear defroster fan switches activate the two fans.

5. **Rotating beacon switch**

   The rotating beacon switch activates the rotating beacon.

6. **Windshield wiper switches**

   The windshield wiper switches activate the windshield wipers.

7. **Head and tail light switch**

   The head and tail light switch activates both the head and tail lights.

8. **Flood light switches**

   The flood light switches activate the front and rear flood lights.

9. **Start switch**

   The start switch engages the starter motor.

10. **Dimmer switch**

    The dimmer switch changes the head lights from bright to dim.

11. **Circuit breaker reset button**

    The circuit breaker reset button re-activates an electrical system that has kicked out.

12. **Air conditioning control**

    The air conditioning control regulates the amount of cool air.

13. **Heater control**

    The heater control regulates the amount of heat desired in the cab area.

14. **Fan speed control**

    The fan speed control regulates the blower fan speed.

15. **Transmission control lever**

    The transmission control lever selects the direction and speed of travel.

16. **Transmission control lever lock**

    The transmission control lever lock sets the control lever in neutral.

17. **Parking/emergency brake control**

The parking/emergency brake control lever releases or applies the parking or emergency brakes.

Note:

The transmission control lock and parking/emergency brake control lever is combined into one lever and serves both purposes.

18. **Governor control lever**

The governor control lever regulates the engine speed.

19. **Transmission modulator pedal**

The transmission modulator pedal disengages the power to the wheels when the pedal is depressed.

20. **Brake pedal**

The brake pedal slows or stops the grader.

21. **Accelerator pedal**

The accelerator pedal increases the engine speed above the set governor speed.

22. **Differential lock**

The differential lock sets the differential so that the speed of the wheels is equal.

23. **Directional lights**

The directional lights indicate the direction the grader is turning.

24. **Decelerator pedal**

The decelerator pedal temporarily decreases the engine speed below the set governor speed.

25. **Hydraulic unloading valve lever**

The hydraulic unloading valve lever reduces the load on the starter while staring a cold engine.

26. **Blade lift lever (left side)**

The blade lift lever (left side) controls the lowering and raising of the left side of the blade.

27. **Ripper/scarifier lever**

The ripper/scarifier lever controls the up and down movement of the ripper.

28. **Blade tip lever**

The blade tip lever controls the forward or backward tilt of the top of the blade.

29. **Blade circle drive lever**

The blade circle drive lever controls the clockwise or counterclockwise circle movement of the blade.

30. **Blade side shift lever**

The blade side shift lever controls the sideways blade movement.

31. **Articulation lever**

The articulation lever controls the left or right articulation of the rear of the grader.

32. **Front mounted scarifier lever**

The front mounted scarifier lever controls the up and down movement of the scarifier.

33. **Center shift lever**

The center shift lever controls the blade's circle movement both to the left and to the right.

34. **Wheel lean lever**

The wheel lean lever controls the amount of lean on the front tires.

35. **Blade lift lever (right side)**

The blade lift lever (right side) controls the lowering and raising of the right side of the blade.

36. **Console lock lever**

The console lock lever locks or unlocks the console.

37. **Steering wheel tilt lock lever**

The steering wheel tilt lock lever locks or unlocks the steering wheel column.

38. **Center shift lock pin control**

The center shift lock pin control retracts the pin from the center shift hole.

39. **Horn switch**

The horn switch blows the horn.

OBJECTIVE 3-3

The grader operator will describe the indicator and warning signals and explain the action to take if a signal appears.

KEYPOINTS/PROCEDURES

1. **Hour meter**

   The hour meter indicates the total number of hours the engine has been operating.

2. **Engine oil pressure gauge**

   The engine oil pressure gauge indicates the crankcase oil pressure. For full load the gauge is normally in the green range and at a low idle the gauge is normally in the white range.

3. **Ammeter gauge**

   The ammeter gauge indicates that the charging circuit is working properly. In normal operation the needle reads slightly to the right of zero or on the plus side. If there is an indication of a discharge, shut off the engine, check for the problem and report the faulty condition to the supervisor. The grader operator should look for a loose or broken alternator belt.

4. **Fuel pressure gauge**

   The fuel pressure gauge indicates the fuel pressure. If the gauge shows a low pressure reading, the fuel filters need to be replaced. Contact the supervisor to make arrangements to have the fuel filters replaced.

5. **Engine coolant temperature gauge**

   The engine coolant temperature gauge indicates the coolant temperature. Under normal operating temperatures the gauge reads in the green range. If the grader has reached the overheating stage and the temperature reading is in the red range, direct the grader immediately to a safe place and park out of the way of other traffic. Shut the engine off and check for the cause of the problem. The grader operator should check:

   - The coolant level — Do not check the coolant level until the engine has cooled down.
   - The engine oil level — Low engine oil causes overheating.
   - Look for leaks of both the coolant and the engine oil.
   - Check to see if the fan belt is loose, missing or broken.

   Caution:

   Never operate a grader with an overheating problem.

6. **Air pressure gauge**

   The air pressure gauge indicates the pressure within the air system. Under normal operating conditions the gauge is in the green colored range. When the air pressure gauge drops below the normal range into the red (60 psi) a warning buzzer sounds and the brakes apply.

   Note:

   The fire gauges are mounted on the back of the engine cowling behind the cab and the engine compartment. The grader operator has to look out of the back window to read the gauges.

7. **Differential unlock indicator**

   The differential unlock indicator is a light that comes on when the differential lock has to be engaged. The light is off when the differential is unlocked.

8. **Alternator discharge indicator**

   The alternator discharge indicator is a light that comes on when a malfunction occurs in the electrical system while the engine is running. If the light comes on, direct the grader to a safe place and park out of the way of other traffic. Shut the engine down and check for the cause of the problem. Look for loose or missing alternator belts and report any problems to the supervisor.

9. **Low air pressure indicator**

   The low air pressure indicator is a light and a buzzer. They operate when the air pressure drops below 60 psi.

10. **Engine coolant high temperature indicator**

    The engine coolant high temperature indicator is a light that comes on when the engine temperature is too high. Direct the grader immediately to a safe place and park out of the way of other traffic. Shut off the engine and check for the cause of the problem. The grader operator should look for:

    - Low coolant levels.
    - Low engine oil levels.
    - Leaks of either the engine oil or the coolant.

    Caution:

    Never operate a grader with a heating problem.

11. **Engine low oil pressure indicator**

    The engine low oil pressure indicator is a light that comes on if there is a loss of oil pressure. Direct the grader to a safe place and park out of the way of traffic. Shut down the engine immediately and check for the cause of the problem. The operator should look for:

    - Low engine oil (check the dipstick).
    - Engine oil leaks.

    Caution:

    Never operate the grader if the oil is below the "add" mark on the dipstick or if the oil pressure light is on.

12. **Articulation indicator**

    The articulation indicator shows the amount that the grader has articulated.

13. **Blade lift accumulator indicator**

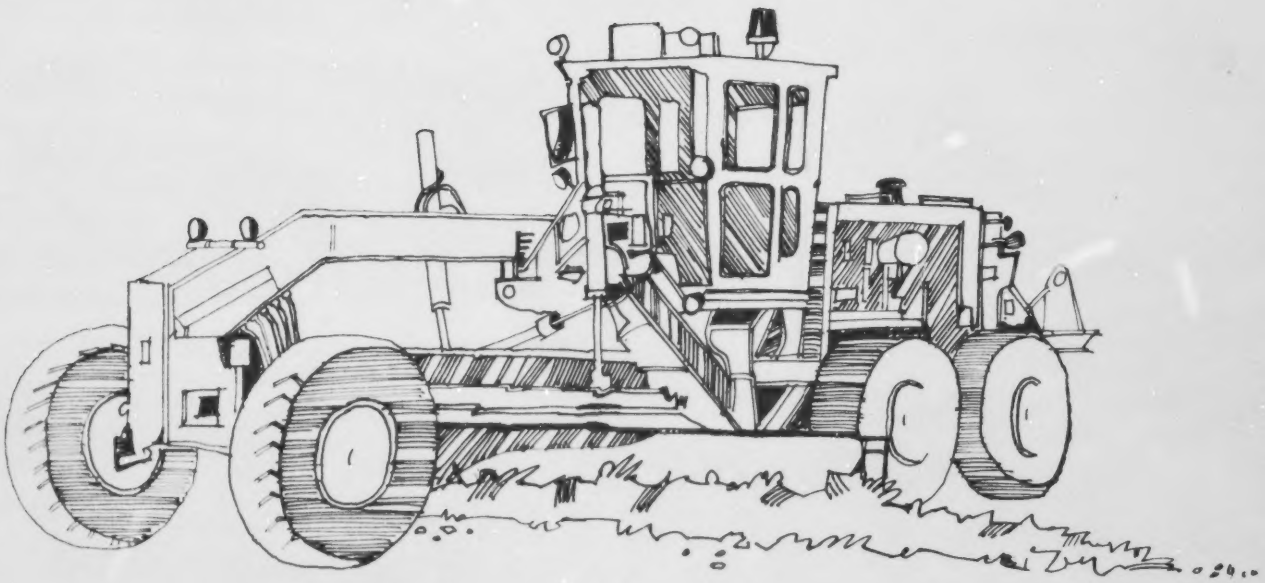
    The blade lift accumulator indicator lights up when the switch is on and the accumulator is activated. The accumulator cushions the blade lift hydraulic circuits from shock caused by external forces.

14. **Center shift indicators (left or right)**

    The center shift indicators (left or right) indicate the position of the lock pin. When the indicators and the marks are lined up the center shift pin is in line with the bore.

PRE-START AND OPERATIONAL CHECKS

module 4



OBJECTIVE 4-1

The grader operator will locate and identify the basic units and related components on the grader.

KEYPOINTS/PROCEDURES

1. **Main frame**

   The main frame is divided into three sections:

   - Front frame.
   - Rear frame and case.
   - Drawbar frame.

   The main frame is the basic unit to which all other units and components are mounted or attached.

2. **Power train**

   The grader power train unit consists of the:

   - Diesel engine.
   - Transmission.
   - Differential.
   - Final drive.
   - Transfer case.
   - Covers and tandem group.

3. **Engine**

   The engine unit includes the:

   - Starting motor.
   - Alternator.
   - Turbochargers.
   - Air cleaners.
   - Radiator assembly.
   - Fuel systems.

4. **Drawbar and circle assembly**

   The drawbar and circle assembly on the grader consists of the:

   - Drawbar.
   - Blade.
   - Cutting edges.
   - Hydraulic cylinders (hoists, center shift, blade tip, side shift).
   - Circle.
   - End bits.
   - Bracket assembly.
   - Shoes, bolts and shims (hold the circle onto the drawbar).
   - Circle reversing mechanism (mounted on the drawbar and turns the circle).
   - Hydraulic swivel assembly.

OBJECTIVE 4-2

The grader operator will locate in a systematic sequence, the pre-start and running check points on the grader.

KEYPOINTS/PROCEDURES

1. The grader pre-start and running check points are:
   - Check the cab for warning flags, lockout tags and read the last entry in the logbook. Check around the grader for personnel.
   - Claim the grader.
   - Front tires and wheels.
   - Steering assembly.
   - Drawbar trunion.
   - Blade.
   - Circle.
   - Engine oil.
   - Fan belts.
   - Alternator belt.
   - Engine coolant level (when the engine is cool).
   - Transmission and differential oil level.
   - Air cleaner indicator.
   - Hydraulic oil level.
   - Fuel level.
   - Drain air tanks.
   - Leaks under the grader.
   - Ladders and handrails.
   - Rear tires and wheels.
   - Lights.
   - Windows and mirrors.
   - Fire extinguisher.
   - Indicators.
   - Controls.
   - Seat belts.

OBJECTIVE 4-3

The grader operator will perform a pre-start check of the grader and describe both the acceptable conditions for each check point and the problems that should be reported to a supervisor.

KEYPOINTS/PROCEDURES

1. **Check the cab for warning flags, lockout tags and read the logbook**

   Before commencing the pre-start check inspect the cab area for other operators, warning flags or lockout tags and read the logbook entries. Also check to ensure that there are no personnel working under or in the immediate vicinity of the grader.

2. **Claim the grader**

   Claim the grader to make sure that no one else moves it. Leave a lunch bucket or some other visual indicator to identify that the grader is in use.

3. **Front tires and wheels**

   Check the front tires and wheels for:

   - Proper tire inflation.
   - Tire cuts and possible separations.
   - Valve stem guards, side flanges, lock ring placements and wheel nuts.

4. **Steering assembly**

   Check the steering assembly. Inspect the:

   - Pivot pins for wear and ensure that they are secure.
   - Spindles for leaking seals.
   - Wheel lean cylinder for leaks in the hose and cylinder ends.
   - Tyrod — check the connection points for wear.
   - Steering cylinder — check the connecting ends for wear, and the hoses for leaks.

5. **Drawbar trunion**

   Check the bolts on the cap to make sure they are secure and that none are missing.

6. **Blade**

   Check the blade for:

   - Cracks.
   - Wear and loose or missing bolts on the cutting edges and end.
   - Missing plates on the bracket blade support.
   - Loose pivot and guide nuts.
   - Hydraulic leaks and worn connection points on the hydraulic tip cylinder.
   - Hydraulic leaks and check that the side shift bracket is tight on the side shift cylinder.
   - Damage and loose or missing bolts on the blade linkage.

7. **Circle**

   Check the circle for:

   - Leaking hydraulic lines.
   - Tightness of the circle shoes and loose or missing bolts.
   - Proper clearance of the motor drive pinion to the circle gear.

8. **Engine oil**

   Check the engine oil at the beginning of each shift. The grader should be on as level an area as possible. If the engine oil level is on the "add" mark have the machine serviced before going into production. There is both a "stop" and "running" side to the dipstick. When the engine is stopped, the oil level is higher than when it is running. It is important to read the appropriate side of the dipstick. If the oil level is "overfull," there is a problem and the oil must be drained down. The problem can be a servicing problem or the result of a transfer from the transmission or the fuel injection system or from an internal leak in the coolant system.

9. **Fan belts**

   Check to see that the fan belts are in good condition and properly adjusted.

10. **Alternator belt**

    Check to see that the alternator belt is in good condition and properly adjusted.

11. **Engine coolant level**

    To check the coolant level when the engine is cool, simply unscrew the radiator cap and be sure that the coolant is approximately 1/2" below the baffle plate. If the grader engine is hot do not physically check the coolant level. Check the dash indicator light to make sure it is not on.

12. **Transmission and differential oil level**

    Check the transmission and differential oil level with the engine running at low idle and at operating temperature. The dipstick must read on the "full" mark. If the level is less than full, have the grader serviced.

13. **Air cleaner indicator**

    With the engine running, observe the air cleaner indicator. If the indicator is in the red, reset it once; if it returns to the red, have the grader serviced.

14. **Hydraulic oil level**

    The blade should be on the ground and the engine stopped before checking the sightglass for the hydraulic oil level. If the grader has been operating, the sightglass should be full; if the grader is cool, the sightglass should be 3/4 full. The least the hydraulic oil level should be is 3/4 full when running at normal temperature level. If the level is below 3/4 full have the grader serviced.

    Caution:

    As most hydraulic oil tanks are pressurized, don't open the filler cap.

15. **Fuel level**

    The fuel level is checked by using a dipstick in the filler neck. The dipstick reads in percentages of fuel remaining. Never let the fuel fall below 10 percent. The grader should be fuelled at least once during a shift and the details recorded.

16. **Drain air tanks**

The dual air tanks are located just under the radiator and have a pet cock on each end. Drain the tank at least once a shift (at least twice during the winter months). Caution should be taken when draining these tanks. Drain the sludge and water until the air is clean.

17. **Leaks under the grader**

Check the ground directly under the grader for evidence of coolant, hydraulic transmission or engine leaks.

18. **Ladders and handrails**

Check the handrails and ladders to ensure that they are intact. Report any broken rails to the supervisor for repair.

19. **Rear tires and wheels**

Check the rear tires and wheels for:

- Proper tire inflation.
- Tire cuts and possible separations.
- Valve stem guards, side flanges, lock ring placements and wheel nuts.
- Possible damage to the brake lines from the wheel chains in the winter months.

20. **Lights**

Check that all lights are clean, free of damage and adjusted properly. Replace any damaged lights before darkness. Do not operate the grader if vision is restricted.

21. **Windows and mirrors**

Check that all windows and mirrors are clean and free of damage. Report any damaged windows or mirrors to the supervisor. Do not operate the grader if vision is restricted.

22. **Fire extinguisher**

Check that there is a fire extinguisher on the grader. Be sure that the seal is not broken and that the gauge reads full. If the extinguisher is missing or has been used report this to the supervisor.

23. **Indicators**

Check all of the indicators in the cab area by turning on the disconnect switch. All of the lights except the differential unlock indicator should be on. If the air pressure is higher than 60 psi the low air pressure indicators will not be on. Pump the service brake pedal several times and the pressure will drop and the indicator will come on.

24. **Controls**

Check all controls to ensure that they are functioning properly. Report any problems to the supervisor.

25. **Seat belts**

Check that the seat belts are in good condition and are properly anchored.

OBJECTIVE 4-4

The grader operator will perform proper engine start up and shut down procedures.

KEYPOINTS/PROCEDURES

1. **Start up**

   Follow these procedures to start the engine:

   a. Check for personnel in the immediate vicinity of the grader.

   b. Look for warning or lockout tags.

   c. Set the transmission control lever in neutral.

   d. Put the park/emergency brake control in park.

   e. Check that all controls are off or in the hold position.

   f. Check that the center shift control is in lock.

   g. Turn the disconnect switch on.

   h. Check that all of the indicator lights are operational.

   i. Move the governor control lever to half engine speed.

   j. Press the accelerator past the detent.

   k. Push the start switch in and turn to start. Once the engine has started release the switch.

   l. Check all indicators and gauges once the engine is running.

2. **Shut down**

   Follow these procedures to shut down the engine:

   a. Park the grader on a level, safe area.

   b. Press down on service brakes to stop the grader.

   c. Place the transmission control lever into the neutral position.

   d. Apply the park brake.

   e. Set the governor control lever to half speed for at least five minutes to cool the engine down.

   f. Lower the hydraulic equipment to the ground and apply slight down pressure (blade and ripper assembly).

   g. Pull the accelerator pedal up past the detent to stop the engine.

   h. Turn off the disconnect switch.

OBJECTIVE 4-5

The grader operator will perform operational checks on the brakes, steering and hydraulic controls prior to putting the grader into production. The operator will also describe acceptable conditions for each check and the problems that should be reported to the supervisor.

KEYPOINTS/PROCEDURES

1. **Brakes**

   To check the brakes on a grader, the operator must:

   a. Put the transmission into first and move forward at low speed.

   b. Apply the service brakes hard and the grader should stop immediatley.

   If the brakes do not hold, report the condition to the supervisor and have the brakes corrected before putting the grader into production.

2. **Steering**

   To check the steering, the operator must put the grader into the lowest operating range and move at slow speed. Turn the steering wheel in both directions to check that the grader is responding correctly. If any problems arise, do not operate until the steering is corrected.

3. **Hydraulic controls**

   To determine the response of the hydraulic controls for the blade and ripper the operator should check:

   - The raise and lower function of both the blade and the ripper.
   - The side shifting response of the blade. This moves the blade sideways.
   - The blade tip response. This control rolls the top of the blade backward or forward.
   - The circle rotating resonse, which controls the blade rotation.

   If any of the responses are not correct, have them serviced.

OBJECTIVE 4-6

The grader operator will describe the proper procedures for a cold weather start of the grader engine.

KEYPOINTS/PROCEDURES

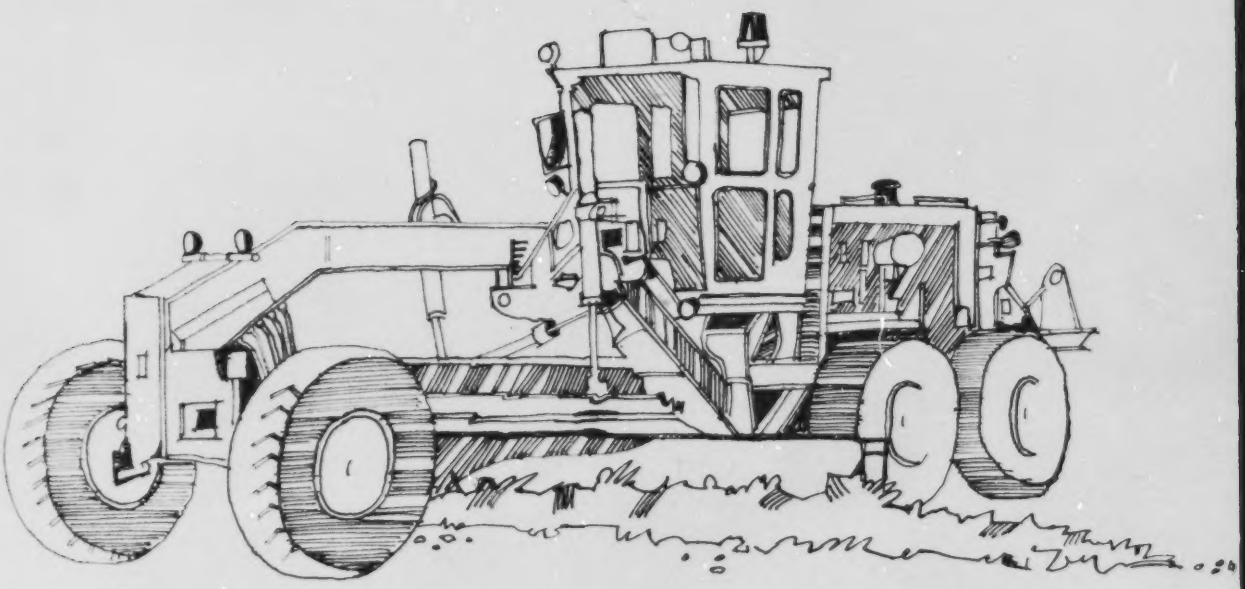
1. Start up procedures are given in OBJECTIVE 4-4.
2. Follow these procedures for cold weather starting:
   a. Push down and hold the hydraulic unloading valve rod until the engine starts. This is done while cranking over the engine. Then hold the valve rod down for another two minutes after the engine has started.
   b. Push in the start switch and turn to the heat position. Hold for the indicated time for the different temperatures.
   c. Turn the start switch on and release it when the engine starts.
   d. If starting fluid is required, spray the starting fluid into the pre-cleaner sparingly. When the engine starts release the start switch.
   e. It can be necessary in very cold weather to put the start switch into the heat position until the engine runs smoothly.
   f. If an engine has been cranked over by the starter for more than half a minute, let the starter cool for 2 minutes before starting to crank again.

Caution:

Do not use excessive starting fluid once the engine has started to run smoothly. When the engine is warm never use starting fluid. Also never use starting fluid and glow plug heating together.

BASIC OPERATION

module 5



OBJECTIVE 5-1

The grader operator will demonstrate moving the grader forward in normal operating conditions and slowly in close quarters.

KEYPOINTS/PROCEDURES

1. **Normal forward motion**

   Follow these procedures to move the grader forward:

   a. Before moving the grader, check for personnel and equipment around the immediate area of the grader.

   b. Start up procedures are given in OBJECTIVE 4-4. Check all gauges and indicators, making sure that everything is functioning properly. Do not move the grader without the air pressure reaching normal operating pressure.

   c. Adjust and fasten the seat belt.

   d. Apply the service brake pedal to hold the grader stationary.

   e. Release the park brake.

   f. Place the governor control lever at the low idle position.

   g. Lift all hydraulic equipment off of the ground (blade and ripper assembly).

   h. Move the transmission control lever into the low forward range position.

   i. Release the service brakes.

   j. Push down on the accelerator pedal gently and the grader will slowly move forward.

   k. To change operating ranges while going forward, release the accelerator pedal and the engine rpm will drop.

   Pull the transmission control lever to the next higher range. It may be necessary to apply the brakes slightly prior to down shifting.

2. **Slow movement**

   For slow movement, put the grader into the lowest operating range on the transmission. The grader ground speed is governed by the transmission modulator pedal.

OBJECTIVE 5-2

The grader operator will demonstrate moving the grader in reverse with normal motion and slowly in close quarters.

KEYPOINTS/PROCEDURES

1. **Normal reverse motion**

   Follow these procedures to reverse the grader:

   a. Before moving the grader, check the immediate area around the grader for other personnel and equipment.

   b. Start up procedures are given in OBJECTIVE 4-4.

   c. Check all gauges and indicators, making sure that everything is functioning properly. Do not move the grader without the air pressure being at normal operating range.

   d. Adjust and fasten the seat belt.

   e. Apply the service brake pedal to hold the grader stationary.

   f. Release the park brake.

   g. Place the governor control lever at the low idle position.

   h. Lift all hydraulic equipment off of the ground (blade and ripper assembly).

   i. Move the transmission control lever into the reverse position.

   j. Release the service brake pedal.

   k. Push down on the accelerator pedal gently and the grader will slowly move in reverse.

   l. To change operating ranges while going in reverse, release the accelerator pedal and the engine rpm will drop. Pull the transmission control lever to the next higher range. It may be necessary to apply the brakes slightly prior to down shifting.

2. **Slow movement**

   For slow movement put the grader into the lowest operating range on the transmission. The grader ground speed is governed by the transmission modulator pedal.

OBJECTIVE 5-3

The grader operator will demonstrate the proper techniques for reversing the direction of the grader.

KEYPOINTS/PROCEDURES

1. In order to reverse directions the operator must:
   a. Bring the grader to a complete stop.
   b. Bring the transmission control lever to the neutral position.
   c. Move the transmission control lever to the desired range and direction.

OBJECTIVE 5-4

The grader operator, using proper steering procedures will demonstrate turning the grader in both directions.

KEYPOINTS/PROCEDURES

1. **Normal steering**

   Turning the grader is a basic procedure once the grader is in motion and a right or left turn is required. Simply turn the steering wheel in the desired direction.

2. **Tight turns**

   In tight turns the operator must:

   a. Reduce the ground speed.

   b. Lean the wheels left for a left turn and right for a right turn.

   c. Turn the wheels in the desired direction of travel.

   d. Disengage the differential lock.

   e. Move the grader as far forward as the turn will allow.

   f. Turn the wheels in the opposite direction. Put the grader in reverse and back up as far as possible so that the grader lines up with the new line of travel.

   g. Turn the front wheels to the new line of travel and if the wheels are still leaning, straighten them up after the turn is made.

3. **Turns using articulation**

   In making turns using articulation, the operator should:

   a. Reduce the ground speed.

   b. Turn tight in the desired direction.

   c. Disengage the differential lock.

   d. Lean the wheel in the desired direction.

   e. Articulate the grader in the direction of the turn.

   f. Once around the turn, turn back the steering wheel and straighten the front wheels.

   g. Articulate the grader back to a straight position.

OBJECTIVE 5-5

The grader operator will demonstrate the proper techniques to stop and park the grader.

KEYPOINTS/PROCEDURES

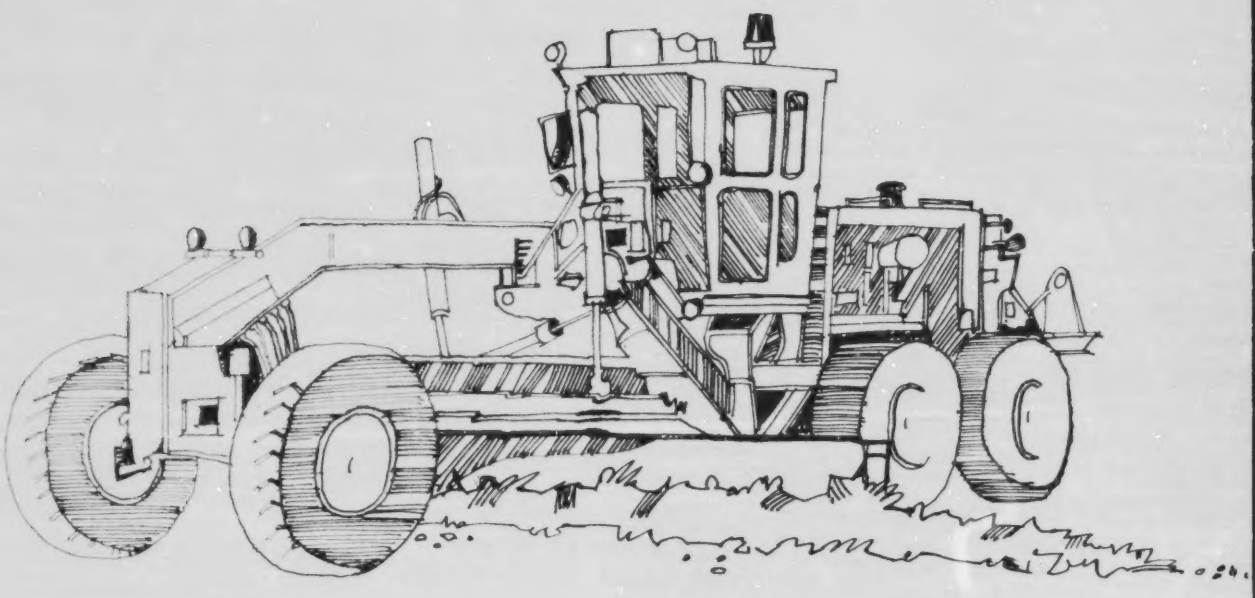
1. To stop and park the grader the operator should:
   a. Park the grader on a safe and level area.
   b. Reduce the engine speed by lifting the foot off of the accelerator pedal.
   c. Press down on the service brakes to bring the grader to a gentle stop.
   d. Hold down the brake pedal to ensure that the grader is held steady.
   e. Place the transmission control lever into the neutral position.
   f. Apply the park brakes.
   g. Lower all of the hydraulic equipment to the ground and apply slight down pressure (blade and ripper assembly).
   h. Perform engine shut down procedures if necessary. Shut down procedures are given in OBJECTIVE 4-4.

Caution:

When assisting a mechanic or working around a grader, make sure the safety link is in place to avoid articulation. Lock the safety link or bar.

GRADER PRODUCTION

module 6



OBJECTIVE 6-1

The grader operator will demonstrate the techniques for forming and handling windrows.

KEYPOINTS/PROCEDURES

1. **Forming windrows**

   The grader operator will form windrows using the following procedures:

   a. Place the transmission control lever in the first forward position.

   b. Move the governor control lever to the desired engine speed.

   c. Set the blade level cutting a few inches into the material.

   d. Angle the blade to allow the material to roll off the end freely.

   e. Tilt the top of the blade slightly forward.

   f. Lean the wheel in the same direction as the earth moving off of the blade.

   g. Articulate the grader for more traction.

   h. While working, a slight adjustment of the blade angle may be necessary to get a smooth flow of material.

   i. Adjust the blade so that the rear wheels do not come in contact with the windrow.

2. **Handling windrows**

   The grader operator will handle windrows using the following procedures:

   a. Level the blade and tilt it slightly forward.

   b. Angle the blade.

   c. Place the toe of the blade into the windrow.

   d. Move the blade sideways so that there is no material falling off of the toe of the blade.

   e. Adjust the angle of the blade and the grader speed until the windrow moves along the blade smoothly.

   f. Articualte the grader so that front wheels are on one side of windrow and the rear wheels are on the other side.

   g. Do not let the tires contact the windrow.

   h. The squarer the blade is kept to the direction of travel the more material that will be moved.

OBJECTIVE 6-2

The grader operator will perform the procedures for road maintenance.

KEYPOINTS/PROCEDURES

1. **Ruts and washboard**

   Follow these procedures for ruts and washboard:

   a. Keep the frame straight.

   b. Set the blade level and tilted forward at the top.

   c. Angle the blade slightly.

   d. On the first pass cut off the high spots and work the material into the low spots.

   e. Go back over the area and with normal grading procedures complete the job.

   f. For crowning the road refer to OBJECTIVE 6-5.

2. **Potholes**

   Follow these procedures for potholes:

   a. Areas with potholes must be ripped. Ripper procedures are given in OBJECTIVE 8-2.

   b. The area that has been ripped must then be dozed.

   c. Then replace and compact the material.

   d. Put the final finish on with the grader.

3. **Low spots**

   Follow these procedures for low spots:

   a. Have the loads dumped in the low area.

   b. Crab the rear wheels in the appropriate way so that the material works off of the blade into the low spot. Crab steering procedures are given in OBJECTIVE 6-24.

   c. No adjustment to the blade is necessary.

   d. Once past the low spot, straighten the frame of the grader and continue grading.

OBJECTIVE 6-3

The grader operator will demonstrate levelling techniques.

KEYPOINTS/PROCEDURES

1. When the road is being used for haulage, grade short sections to ensure that the windrows are moved across the road quickly and are coordinated with the cycles of the trucks. This is important to reduce tire damage and traffic congestion.

2. **Right hand levelling**

   To level an area from right to left use the following procedures:

   a. By using the centershift cylinder, position the circle about eight to ten inches to the left.

   b. Place the transmission control lever in the first forward position.

   c. Move the governor control lever to the desired engine speed.

   d. Side shift the blade so that it is set to cast the material to the outside of the left rear wheels.

   e. Set the blade on the horizontal and at the desired depth of cut.

   f. Set the front wheels to lean to the left to avoid a side slip.

   g. Start the cut with the tip of the moldboard slightly ahead of the cutting edge. Then tip forward the top of the blade for the first spread of the material.

   h. Keep working the material until it is spread out smoothly.

3. **Left hand levelling**

   To level an area working from left to right use the following procedures:

   a. By using the centershift cylinder, position the circle about eight to ten inches to the right.

   b. Place the transmission control lever in the first forward position.

   c. Move the governor control lever to the desired engine speed.

   d. Sideshift the blade so that it is set to cast the material to the outside of the right rear wheels.

   e. Set the blade on the horizontal and at the desired depth of cut.

   f. Set the front wheels to lean to the right to avoid a side slip.

   g. Start the cut with the tip of the moldboard slightly ahead of the cutting edge. Then forward the top of the blade for the first spread of the material.

   h. Keep working the material until it is spread out smoothly.

OBJECTIVE 6-4

The grader operator will demonstrate planing techniques.

KEYPOINTS/PROCEDURES

1. Follow these procedures for planing:
   a. Set the blade at the desired angle.
   b. Position the blade at the desired depth of cut.
   c. Cut enough material so that the blade is kept partially full at all times.
   d. To spread the material effectively, move the blade, full of material, both forwards and sideways.
   e. Keep working the windrows to the desired side.
   f. On the final pass take a lighter cut, with the trailing end of the blade lifted enough to allow the material to go under it. This leaves a finished look with no ridge or windrows.

OBJECTIVE 6-5

The grader operator will demonstrate crowning techniques.

KEYPOINTS/PROCEDURES

1. Follow these procedures for crowning roads:
   a. Work a small section of the road at a time so that it can be completed within the allotted time for the job.
   b. Blade the material inwards from the shoulders and ditches.
   c. First make a pass down one side of the road. Then, make a pass up the other side always moving the material to the center of the road.
   d. Work the windrows towards the center. The blade should be positioned at a 10 to 25 degree angle towards the center of the road.
   e. Use a fast working speed to spread and blend the material easier.
   f. Spread the material built up in the center. Position the blade straight and move the grader at a high speed.
   g. Make sure the blade does not come into contact with the undisturbed roadbed. A blade coming into contact with solid material can damage the grader.

OBJECTIVE 6-6

The grader operator will demonstrate the techniques for manoeuvering around an object.

KEYPOINTS/PROCEDURES

1. Follow these procedures for manoeuvering around an object:
   a. Grade close to the object.
   b. While moving slowly sideshift the blade away from the object.
   c. Depress the transmission modulator pedal to move the grader very slowly around the object.
   d. Once the object has been cleared, sideshift the blade to its original setting and continue grading.

OBJECTIVE 6-7

The grader operator will demonstrate the proper techniques for backing out of a ditch or a drop-off.

KEYPOINTS/PROCEDURES

1. Follow these procedures for backing out of a ditch or a drop off:
   a. When encountering a ditch or drop-off stop the grader immediately.
   b. Raise the blade and ripper.
   c. Articulate to the side that has no ditch or drop-off.
   d. Back up slowly. While backing up turn the front wheels so that they steer away from the drop-off.
   e. Keep backing out until the grader is clear.

OBJECTIVE 6-8

The grader operator will demonstrate the techniques for grading on curves.

KEYPOINTS/PROCEDURES

1. **Left hand curve**

   Follow these procedures for grading on left hand curves:

   a. While in the process of grading, articulate the grader left.
   b. Turn the front wheels to the left.
   c. Sideshift the blade to the right.
   d. While coming out of the curve straighten the front wheels.
   e. Sideshift the blade if necessary.

2. **Right hand curve**

   Follow these procedures for grading on right hand curves:

   a. On entering a right hand curve, articulate the grader to the right.
   b. Turn the front wheels to the right.
   c. Sideshift the blade to the left.
   d. Coming out of the curve straighten the front wheels.
   e. Sideshift the blade if necessary.

3. For very sharp turns, disengage the differential lock.

OBJECTIVE 6-9

The grader operator will demonstrate extreme side reach techniques.

KEYPOINTS/PROCEDURES

1. Follow these procedures for extreme side reach:
   a. Position the centershift pins to full right or left depending on the side the operator wants to work.
   b. Fully sideshift the blade to the desired side.
   c. Angle the blade so that the material is delivered to the side.
   d. Set the blade to the desired depth of cut.

Caution:

When performing this procedure, the drawbar and circle assembly are in a vulnerable position. Operate the grader in the lowest range and with extreme caution to prevent damage.

OBJECTIVE 6-10

The grader operator will demonstrate "V" ditching techniques.

KEYPOINTS/PROCEDURES

1. **Right hand "V" ditching**

   Follow these procedures for right hand "V" ditching:

   a. Position the frame straight, making sure that the grader is not articulated.

   b. Put the centershift lock in the center position. The blade should be on the ground before the centershift lock pin is retracted.

   c. Align the right end of the blade with the outer edge of the front right tire.

   d. Angle the blade so that the material is delivered to the inside of the left rear wheels.

   e. Raise the left lift cylinder to the high position.

   f. Lower the right lift cylinder and set the blade tip at the desired depth of cut.

   g. Lean the wheels to the left.

   h. When pushing material, keep the front right wheel in the bottom of the ditch.

   Cautions:

   For all ditching techniques, use caution to avoid possible tire damage from large sharp rocks in the ditch.

   When performing this procedure, the drawbar and circle assembly are in a vulnerable position. Operate the grader in the lowest range and with extreme caution to prevent damage.

OBJECTIVE 6-11

The grader operator will demonstrate ditch back sloping techniques.

KEYPOINTS/PROCEDURES

1. **Right side ditch back sloping**

   Follow these procedures for ditch back sloping from the right side of the grader:

   a. Tilt the blade forward.

   b. Shift the centershift lock pin to the full right or top position.

   c. Then rotate the circle to the left.

   d. As the circle is being turned, lower the left lift cylinder.

   e. Set the heel of the blade in front of the rear right tire.

   f. Lower the right lift cylinder to the desired degree of slope.

   g. Lean the front wheels toward the slope of the heavier cut.

2. **Left side ditch back sloping**

   Follow the same procedures as ditch back sloping from the right side but in the opposite direction.

   Caution:

   When performing this procedure, the drawbar and circle assembly are in a vulnerable position. Operate the grader in the lowest range and with extreme caution to prevent damage.

OBJECTIVE 6-12

The grader operator will demonstrate the techniques for grading in a wet ditch.

KEYPOINTS/PROCEDURES

1. Follow the procedures described for ditch cleanup in OBJECTIVE 6-13.
2. Articulate the grader so that the front wheels and the blade are in the ditch and the rear wheels are on the solid shoulder.

   Caution:

   When performing this procedure, the drawbar and circle assembly are in a vulnerable position. Operate the grader in the lowest range and with extreme caution to prevent damage.

OBJECTIVE 6-13

The grader operator will demonstrate ditch cleanup techniques.

KEYPOINTS/PROCEDURES

1. **Right hand ditch cleanup**

   Follow these procedures for right hand ditch cleanup:

   a. Position the centershift lock pin in the right middle position.

   b. Align the right end of the blade with the outer edge of the front right tire using the side shift.

   c. Lower and set the blade to the depth of the ditch using the right lift cylinder.

   d. Position the left lift cylinder to deliver the material pulled from the ditch, onto the slope between the rear wheels.

   e. Lean the front wheels to the left.

   f. Another pass may be necessary to get the material completely out of the ditch and onto the shoulder of the road.

   g. Finish the job by spreading the material.

2. **Left hand ditch cleanup**

   Follow the same procedures as right hand ditch cleanup but in the opposite direction.

   Caution:

   When performing this procedure, the drawbar and circle assembly are in a vulnerable position. Operate the grader in the lowest range and with extreme caution to prevent damage.

OBJECTIVE 6-14

The grader operator will demonstrate flat bottom ditching techniques.

KEYPOINTS/PROCEDURES

1. **Right side flat bottom ditching**

   Follow these procedures for flat bottom ditching from the right side of the grader:

   a. Develop a "V" ditch to the desired depth of the flat bottom ditch using the techniques described in OBJECTIVE 6-10.

   b. Once the "V" ditch has been established, start cutting the flat bottom by positioning the right lift cylinder to the required depth.

   c. Position the left lift cylinder.

   d. Set the centershift lock pin at the high right position.

   e. The front right tire must follow the bottom of the "V" ditch.

   g. Position the blade so that the right end is at the bottom of the back slope of the ditch.

   h. Lower the right lift cylinder so that the point of the blade is on the established grade of the ditch.

   i. Lower the left lift cylinder to the desired depth of the cut.

   j. Lean the front wheels to the left.

   k. Set the blade at a sharp angle and move the material up the slope of the ditch between the rear wheels.

   l. Finish spreading the material that has come from the ditch.

2. **Left side flat bottom ditching**

   Follow the same procedures as flat bottom ditching from the right side but in the opposite direction.

   Caution:

   When performing this procedure, the drawbar and circle assembly are in a vulnerable position. Operate the grader in the lowest range and with extreme caution to prevent damage.

OBJECTIVE 6-15

The grader operator will demonstrate shoulder cleanup techniques.

KEYPOINTS/PROCEDURES

1. **Right hand shoulder cleanup**

   Follow these procedures for right hand shoulder cleanup:

   a. Position the centershift lock pin to the right middle position.

   b. Position the right end of the blade in line with the outer edge of the right front tire.

   c. Angle the blade so that the material is delivered between the rear wheels. Make sure the blade end does not come in contact with the front tires. When windrowing, the grader should straddle the windrow. Make sure the tires don't run on the windrow.

   d. Position the blade horizontal by lowering the lift cylinders.

   e. Lower the blade to the desired depth of cut.

   f. Lean the front wheels to the left.

2. **Left hand shoulder cleanup**

   Follow the same procedures as the right hand shoulder cleanup but in the opposite direction.

   Caution:

   When performing this procedure, the drawbar and circle assembly are in a vulnerable position. Operate the grader in the lowest range and with extreme caution to prevent damage.

OBJECTIVE 6-16

The grader operator will demonstrate the techniques for making high bank cuts.

KEYPOINTS/PROCEDURES

1. **Right side high bank cuts**

   Follow these procedures for making a high bank cut on the right side:

   a. Prepare the road so that it is sloped into the bank.

   b. Roll the top of the blade between 3/4 to full roll forward.

   c. Position the centershift lock pin in the full right position.

   d. Sideshift the blade fully to the right.

   e. Rotate the circle counterclockwise. While the circle is rotating lower the left lift cylinder.

   f. Set the end of the blade at the bottom of the slope by lowering the left lift cylinder. The blade should be in line with the center of the rear tire.

   g. Once the cut has begun, the right rear tires should be in a "V" at the base of the slope.

   h. To set the desired degree of slope on the bank, lower the right lift cylinder.

   i. Start the cut gradually and at low speed.

   j. Lean the front wheels into the slope for heavier cuts and away from the slope for lighter cuts.

   k. Move the material from the slope to the outside of the rear wheels.

2. **Left side high bank cuts**

   Use the opposite procedures for left side slope grading.

   Caution:

   When performing this procedure, the drawbar and circle assembly are in a vulnerable position. Operate the grader in the lowest range and with extreme caution to prevent damage.

OBJECTIVE 6-17

The grader operator will demonstrate the "V" ditch and flat bottom ditch techniques for road building.

KEYPOINTS/PROCEDURES

1. **"V" ditch method**

   Follow these procedures for the "V" ditch method of road building:

   a. Mark out the ditch lines on each side of the prepared road.

   b. Make a heavy second cut causing the windrow to roll under the grader.

   c. Make another heavy cut down the "V" ditch and roll the material under the grader.

   d. Work both sides at the same time, first one ditch and then the other.

   e. In the next cut clean the large windrows left from the marking out of the ditch.

   f. Grade the material off of the shoulder toward the middle of the road.

   g. By doing both sides, the material will be worked into the center.

   h. Once the material has been collected at the center, the final crowning of the road can be accomplished.

2. **Flat bottom ditch method**

   Follow these procedures for the flat bottom method of road building:

   a. Form the first "V" ditch on both sides of the road.

   b. Grade the inside slope of the ditch flatter and work the material up onto the shoulder.

   c. Work the material off of the shoulder toward the center of the road.

   d. Finish the bank slope of the ditch.

   e. Flatten the bottom of the ditch and work the material up the inside slope of the ditch to the shoulder.

   f. Complete the finishing grading to the inside slope.

   g. Grade the material from the shoulder toward the center.

   h. Once the material from both sides has been worked to the center, the road can be crowned and completed.

OBJECTIVE 6-18

The grader operator will demonstrate the proper techniques for levelling loads.

KEYPOINTS/PROCEDURES

1. **Levelling from the side of the load**

   Follow these procedures for levelling from the side of the load:

   a. Depending on the available space, extend the blade the desired amount into the load and make a series of cuts.

   b. Set the blade at a slight angle.

   c. After each cut continue pushing and spreading the material.

   d. Repeat the cuts until the load has been spread.

2. **Levelling over the top of the load**

   This technique is only used for fine material. Follow these procedures for levelling over the top of the load:

   a. Depending on the height of the load drive the grader over the material.

   b. Set the blade straight.

   c. The front axle will push part of the material off.

   d. Then cut as much material with the blade as the power will allow.

   e. Raise the blade slightly and reduce the cut to gain power.

OBJECTIVE 6-19

The grader operator will clean spill rock to prevent tire damage to rubber tire equipment.

KEYPOINTS/PROCEDURES

1. **Road hazards**

   The grader operator must constantly be alert to spill rock off of trucks, metal objects and potholes. The operator should grade any foreign material off of the road while travelling.

2. **Work face area**

   In the work face area, the grader operator should be alert to spill rock from haulage trucks and shovel buckets. This loose material must be graded back into the face for the shovel to load out.

OBJECTIVE 6-20

The grader operator will demonstrate the proper techniques for cleaning up the shovel area.

KEYPOINTS/PROCEDURES

1. Follow these procedures for cleaning the loading area:
   a. Make sure the truck operators, shovel operators and ground personnel are aware of the grader's presence in the work area before starting work. If radio contact cannot be made, enter the area on the cab side of the shovel, making visual contact with the shovel operator.
   b. Follow the basic levelling procedures. With the grader in forward and the blade contacting the ground surface, grade all the spill rock back into the face area. The material should be graded and left so that the shovel operator can reach it and load it out.

Cautions:

Although the operator can work within the bucket swing radius the grader should never enter the shovel counterweight swing radius.

When the grader is working in the face area, the operator should be aware that sloughing may occur, and must always have a plan of retreat.

OBJECTIVE 6-21

The grader operator will demonstrate the procedures for cleaning up flyrock after a blast.

KEYPOINTS/PROCEDURES

1. Cleaning up after a blast is a basic grading operation. The operator must remove flyrock that has landed on the haul roads and within the shovel working area. In the shovel working area, the flyrock is graded into the work face; on the haul roads, the flyrock is graded off of the road.
2. Grade the flyrock with the grader in forward motion and the blade just touching the ground surface.
3. The same procedure is used to clear road spill from haulage trucks in the work area or on haul roads. Grade the material off of the road.

OBJECTIVE 6-22

The grader operator will demonstrate how to clean a site for drilling.

KEYPOINTS/PROCEDURES

1. The grader operator should talk with the supervisor to obtain the necessary information on:
   - How large an area is to be cleaned.
   - Which direction the material is to be graded.
2. The preparation of the drill site is a basic grading operation. The area to be prepared is usually flat from previously being a bench. Often drill site areas only require a cleanup of backbreak left on the bench and in some cases a small amount of flyrock from previous blasts.
3. With the grader in forward motion and the blade just touching the ground surface, grade the material into the previously blasted area.

OBJECTIVE 6-23

The grader operator will demonstrate the techniques for snow removal.

KEYPOINTS/PROCEDURES

1. The grader operator will follow these procedures for snow removal:
   a. Follow the same procedures given in OBJECTIVE 6-4 for planing and OBJECTIVE 6-18 for levelling.
   b. Higher speeds can be used because of the nature of snow.
   c. The blade should just contact the road surface.
   d. Work the snow from the inside ditch to the outside edge of the road, if there are safety berms. The snow should be pushed over the berm with either a dozer, a rubber tire dozer or a loader.
   e. Where there are no permanent safety berms, an attachable snow wing can be used to shoot the snow over the outside edge of the road.
   f. Once the snow is removed, the ice blade can be used to rough up previously sanded material.

Caution:

The grader must be properly chained before proceeding with snow removal on extreme grades. Extreme caution must be used.

OBJECTIVE 6-24

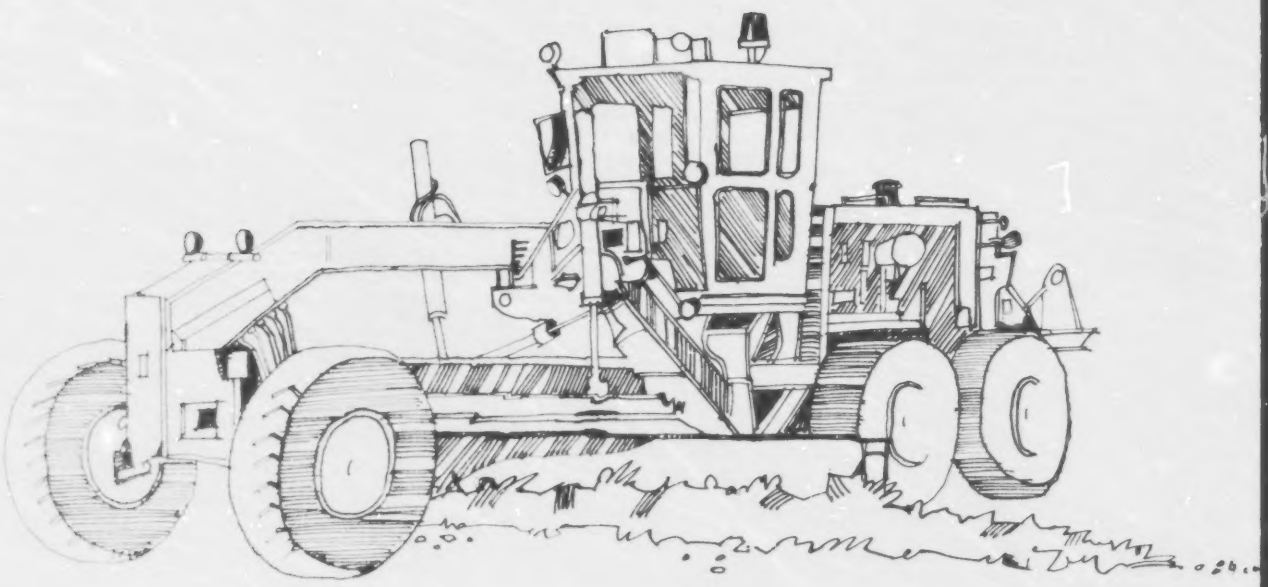
The grader operator will demonstrate crab steering techniques.

KEYPOINTS/PROCEDURES

1. Follow these procedures for crab steering:
   a. Articulate the grader to the desired side.
   b. Adjust the front wheels parallel to the rear wheels.
   c. Angle the blade slightly.
   d. Move the material away from the path of the rear wheels.
   e. While working on slopes, keep the rear of the grader articulated to the downhill side of the cut.

SERVICE AND REFUEL

module 7



OBJECTIVE 7-1

The grader operator will demonstrate safely entering the lube and oil house area and explain all precautions to take.

KEYPOINTS/PROCEDURES

1. The grader operator, when entering the lube and oil house area, must put the transmission into the lowest operating range. Use **extreme caution.** There may be slippery conditions when braking and also when entering other pieces of equipment and personnel moving around the area. The key to safety in the lube and oil house area is the use of low speeds.

2. When the grader is being serviced, the operator must climb down to the ground. Use the ladder and handrails when climbing down. Never jump off of a grader. Before leaving the cab, the operator must follow the parking procedures given in OBJECTIVE 5-5.

OBJECTIVE 7-2

The grader operator will demonstrate the procedures for having the grader refuelled by a fuel truck and explain all precautions to take.

KEYPOINTS/PROCEDURES

1. The operator must follow company procedures for refuelling in the field.
2. Follow these procedures for refuelling a grader:
   a. Before refuelling, the grader and fuel truck operators must be aware of each other's presence.
   b. After being spotted by the fuel truck driver, the grader operator should, if directed, perform the standard parking and shut down procedures as given in OBJECTIVE 4-4.
   c. The operator must get out of the cab and stay on the ground during the refuelling operation.
   d. After refuelling and servicing and before starting up, the operator must walk around the grader to make sure that no one is in the area.
3. While the grader is in the pit, the operator must be aware of other pieces of equipment and personnel in the area.
4. It is the operator's responsibility to ensure that the grader is properly serviced before being put back into operation.

Caution:

If there is work to be done in the articulating area of the grader, connect the frames with the anti-pivot link before servicing the center area. This is very important.

OBJECTIVE 7-3

The grader operator will demonstrate the practices of good housekeeping on the grader and in the fuel and service areas, both in and out of the pit.

KEYPOINTS/PROCEDURES

1. The grader operator should follow these good housekeeping practices while on the grader:
   - Clean all of the windows.
   - Remove all rags, paper and dirt from the cab.
   - Do not store any aerosol cans in the cab because there is the danger of an explosion.
   - Keep all handrails and ladders free of grease. Grease may cause slips and falls.
   - The cab floor must be kept clean at all times to prevent foreign objects from interfering with the control pedals.
2. The operator should report potential hazards and cleanup in the service area while the grader is being serviced. For example:
   - Pick up all oily rags, paper, etc. and put them into a barrel for disposal.
   - Cleanup as soon as possible oil spills on the floor. Eliminate all possible hazards that can cause slips and falls.
3. Continually cleanup old rags, and paper, etc. The refuel site usually changes with the pit situation.
4. Good housekeeping in the pit is just as important as in the service areas. Be aware of old rags and papers on the ground and pick them up and dispose of them properly during the refuelling operation.

SPECIAL ASSIGNMENTS

module 8

OBJECTIVE 8-1

The grader operator will demonstrate the proper techniques for towing equipment.

KEYPOINTS/PROCEDURES

1. Follow these procedures for towing equipment with a grader:
   a. Prepare the piece of equipment that is to be towed.
   b. Select the appropriate cables to handle the job.
   c. Hook up the piece of equipment to the grader.
   d. Secure the safety lines.
   e. Select a low speed for travel.
   f. Where necessary use someone on the ground.
2. Safety and planning are the keys to towing equipment.

OBJECTIVE 8-2

The grader operator will demonstrate the proper use of the scarifier and the ripper.

KEYPOINTS/PROCEDURES

1. **Rear mounted scarifier**

   Follow these procedures to operate the rear mounted scarifier:

   a. Use five to seven shanks on the ripper.

   b. Scarify in light material only.

   c. Keep the frame of the grader straight and not articulated during the operation.

   d. Penetrate the material gradually.

   e. Place the transmission control lever in the first operating range and travel at low speed.

   f. Keep the line of travel straight.

   g. Avoid turns with the shanks penetrating the material in order to avoid damage to the shanks.

2. **Front mounted scarifier**

   Follow these procedures to operate the front mounted scarifier:

   a. Keep the grader frame straight and not articulated.

   b. Place the transmission control lever in the lowest operating range.

   c. While travelling in a straight line, penetrate the material gradually. Keep the penetration at the desired depth as long as the material permits it.

   d. The speed of travel is in relation to the load. If the load is heavy, slow the speed down. Once the grader starts to labour, lift the scarifier up until it operates easily.

   e. On grades, work the scarifier downhill.

   f. Avoid turns while the shanks are penetrated into the material.

3. **Ripper**

   Follow these procedures to operate the ripper:

   a. The grader frame must be straight and not articulated when using the ripper.

   b. Place the transmission control lever in the lowest operating range.

   c. With the grader moving forward, lower the ripper shank (or shanks) to the desired depth in the material.

   d. When the grader begins to labour or slow down, raise the ripper slightly until the grader starts to pull normally again.

   e. Use the accelerator pedal to ensure a smooth, steady pace while using the ripper.

   f. When ripping hard material, vary the ripper shank penetration as necessary.

   g. Keep the spacing of the ripper passes close to one another as smaller sized material is easier to handle.

   h. Rip downhill whenever possible.

   i. Do not turn the grader when the ripper shanks are penetrating into the ground. This can damage the ripper assembly.

4. Avoid spinning the tires.

Province of
British Columbia

OPEN PIT MINING JOE
GRADER OF
SKILL PROFI

BASIC SAFETY AND OPERATING RULES	EXPLAIN THE IMPORTANCE OF SAFETY AND OPERATING RULES	EXPLAIN THE IMPORTANCE OF REPORTING ACCIDENTS AND INJURIES	EXPLAIN THE IMPORTANCE OF STAYING ALERT TO CHANGING CONDITIONS	EXPLAIN THE COMPANY TRAFFIC CONTROL SCHEME	EXPLAIN HOW TO AVOID TIRE DAMAGE	NC EI BRAK
	EXPLAIN THE COMPANY'S POWER CABLE HANDLING POLICY	EXPLAIN THE COMPANY'S LOCK-OUT PROCEDURES				
COMMUNICATIONS	SEND AND RECEIVE SIGNALS	FILL OUT REPORT FORMS	OPERATE THE MOBILE RADIO	READ SURVEY STAKES		
INDICATORS AND CONTROLS	LOCATE AND IDENTIFY THE INDICATORS AND CONTROLS	DESCRIBE THE FUNCTION OF EACH CONTROL AND SWITCH	DESCRIBE THE INDICATOR AND WARNING SIGNALS AND EXPLAIN THE ACTION TO TAKE			
PRE-START AND OPERATIONAL CHECKS	LOCATE AND IDENTIFY THE BASIC UNITS AND RELATED COMPONENTS	LOCATE IN SEQUENCE THE PRE-START AND OPERATIONAL CHECK POINTS	PERFORM A PRE-START CHECK	PERFORM THE ENGINE START UP AND SHUT DOWN PROCEDURES	PERFORM OPERATIONAL CHECKS	THE P A C (OPT
BASIC OPERATION	MOVE THE GRADER FORWARD	REVERSE THE GRADER	REVERSE THE DIRECTION OF TRAVEL	STEER THE GRADER	STOP AND PARK THE GRADER	
GRADER PRODUCTION	FORM AND HANDLE WINDROWS	PERFORM ROAD MAINTENANCE	PERFORM LEVELLING	PERFORM PLANNING	PERFORM CROWNING	
	PERFORM DITCH CLEANUP	PERFORM FLAT BOTTOM DITCHING	PERFORM SHOULDER CLEANUP	MAKE HIGH BANK CUTS	BUILD ROADS	
SERVICE AND REFUEL	ENTER THE LUBE AND OIL HOUSE AREA	REFUEL THE GRADER	PRACTISE GOOD HOUSEKEEPING			
SPECIAL ASSIGNMENTS	TOW EQUIPMENT	OPERATE THE SCARIFIER AND THE RIPPER				

JOB TRAINING SERIES
OPERATOR
OFILE CHART

Developed by:
Research and Curriculum Development Branch
Post-Secondary Department
Ministry of Education
1982

EXPLAIN NORMAL AND EMERGENCY BRAKING TECHNIQUES	EXPLAIN EMERGENCY STEERING PROCEDURES	EXPLAIN THE IMPORTANCE OF GOOD HOUSEKEEPING	EXPLAIN THE COMPANY BLASTING AND GUARDING PROCEDURES	DESCRIBE THE BASIC LAYOUT OF THE PIT AREA	EXPLAIN THE USE OF FIRE SUPPRESSION SYSTEMS AND FIRE EXTINGUISHERS	DESCRIBE MISS-HOLES AND MISS-HOLE REPORTING PROCEDURES
DESCRIBE THE PROCEDURES FOR A COLD WEATHER START (OPTIONAL SECTION)						
MANOEUVER AROUND AN OBJECT	BACK OUT OF A DITCH OR A DROP OFF	GRADE ON CURVES	PERFORM EXTREME SIDE REACH	PERFORM "V" DITCHING	PERFORM DITCH BACK SLOPING	GRADE WET DITCHES
LEVEL ROADS	CLEAN SPILL ROCK	CLEAN THE SHOVEL AREA	CLEAN UP FLYROCK AFTER A BLAST	CLEAN THE DRILL SITE	REMOVE SNOW	PERFORM CRAB STEERING

THE DACUM APPROACH

DACUM is a systematic model of program development used in designing career, technical and vocational training programs. The first step in the process is to establish the skills expected of a graduate entering employment. These skills are generally specified by a representative employer group in a workshop conducted by program development specialists. The product of this activity is a skill profile chart. This chart is then circulated both to the participants and to a number of other employers for review prior to further development.

The next step is to specify learner-centred performance objectives. These include not only the skills a learner must demonstrate but also the conditions under which the skill is to be performed and the criteria used to determine the acceptable standard of performance.

Once the performance objectives have been set, there are three important steps to complete the development process. These are generally undertaken by an instructor or group of instructors, in the following order:

1) Appropriate evaluation instruments are chosen or created to assess student capability in relation to the specific objectives of the program.

2) A variety of suitable instructional techniques and learning experiences are chosen to facilitate learning of the skills and knowledge required to meet the objectives.

3) Instructional resources (texts, films, models, and other learning aids) are selected or created.

READING THE SKILL PROFILE CHART

A skill profile chart (often referred to as a DACUM Chart), is a graphic representation of the essential skills expected of a student graduating from a specific career, vocational or technical program.

Broad areas of employee responsibility are shown in the boxes on the left of the chart. These are called "general areas of competence". The tasks or skills related to each are sequenced along the horizontal track to the right of the general area of competence.

FOR FURTHER INFORMATION

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ADDITIONAL COPIES

Additional copies of this chart and performance objectives may be ordered from:

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